

CSC 261/461 Database Systems
Fall 2018
Homework 3
Due: **Sat 11/10 11:59 PM**

Problem 1 (4 points)

Suppose we decompose the schema $R = (A, B, C, D, E)$ into $R_1(A, B, C)$ and $R_2(A, D, E)$. Use one of the methods discussed in lecture to say if the decomposition is a lossless-join or not if the following set F of functional dependencies holds: $\{A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A\}$

Problem 2 (6 points)

Given the database schema $R(a, b, c)$, and a relation r on the schema R , write an SQL query to test whether the functional dependency $b \rightarrow c$ holds on relation r (a). Also write an SQL assertion that enforces the functional dependency. Assume that no null values are present (b). (Although part of the SQL standard, such assertions are not supported by any database implementation currently.)

Problem 3 (12 points)

Consider the relation $Courses(C, T, H, R, S, G)$, whose attributes may be thought of informally as course, teacher, hour, room, student, and grade. Let the set of FD 's for $Courses$ be $F = \{C \rightarrow T, HR \rightarrow C, HT \rightarrow R, HS \rightarrow R, CS \rightarrow G\}$. Intuitively, the first says that a course has a unique teacher, and the second says that only one course can meet in a given room at a given hour. The third says that a teacher can be in only one room at a given hour, and the fourth says the same about students. The last says that students get only one grade in a course.

- a) What are all the keys for $Courses$? (4)
- b) Is the given set F of FD's a minimal cover for F itself? Explain. (4)
- c) Use the 3NF algorithm discussed in lecture to find a lossless-join, dependency-preserving decomposition of R into 3NF relations. (4)